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Veröffentlichungsversion / Published Version
Sammelwerksbeitrag / collection article

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Digital Divides and the Internet

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Introduction

As access to and usage of the Internet has been increasing dramatically in the industrialized world since the second half of the 1990s, the research interest of social scientists has gradually shifted from focusing solely on access to the Internet to studying the social implications and repercussions of the network. But also in this context, as is emphasized in a review article by DiMaggio et al., »research on inequality in access to and use of the Internet (remains) an important priority for sociologists« (DiMaggio et al. 2001, p. 314). The term »digital divide« refers to this aspect of social inequality. The following analysis starts with a look at the digital divide from a macro-perspective to examine how institutional factors in particular affect the adoption of the Internet. Then I only briefly address the impact of micro and meso factors because this is an area, which most studies have focused on. Finally I turn to a type of digital divide, which manifests itself in the evolving network topology as an unintended effect of collective Internet use – an aspect hardly ever considered in social analysis.

The digital divide from a macro-perspective

The macro-perspective focuses on differences between countries in access to and use of the Internet. »Socio-cultural resources« such as general favorable attitudes towards new technologies and the population's generalized trust are among the causal factors affecting particularly the initial diffusion of the Internet (Bornschier 2001). Relevant socio-economic factors which account for the differences in inter-

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1 Eine ausführlichere Version dieses Beitrags erscheint unter dem Titel »The Dynamics of the Digital Divide« in: Arno Bammé, Günter Getzinger, Bernhard Wieser (eds.), Yearbook 2005 of the Institute for Advanced Studies on Science, Technology and Society. München: Profil, 2005.

connectivity are economic wealth and telephone density but also the countries' regulatory environments (Hargittai 1999; Chinn/Fairlie 2004).

Many macro-factors are difficult to change. But the emphasis on regulatory environments directs attention to a set of institutional factors which have changed dramatically in many industrialized countries. Formerly public telecommunications administrations were transformed into private companies and the telecommunications markets have been opened to competition (Schneider 2001; Schneider/Tenbücken 2004). At the same time the organizational landscape of international technical standardization has become more heterogeneous (Werle 2001). In this period of change technology policy and industrial policy had to adapt to the more liberal institutional environment in which traditional hierarchical coordination of development and diffusion of technological innovations was not feasible anymore. Predominantly in Continental Europe these changes unleashed a dynamics of Internet diffusion and use that was unknown hitherto. This indicates that the »old institutional order« in effect hampered rather than facilitated the diffusion of the Internet.

In the early 1980s when the Internet started to take shape in the United States, industrial policy in most Continental European countries was geared to supporting single large national firms (»national champions«) and protect them from competition. In accordance with the national technology policy these firms and the public telecommunications monopolies regularly concerted their innovative efforts developing a narrow set of technological options (Kogut 2003a). In the United States competition prevailed in the computer industry and after the divestiture of the private telecommunications monopoly AT&T in the early 1980s competition likewise emerged in this industry. Many Bell Operating Companies striving for new commercial opportunities entered the market for data networks and services. Public funding of technical development in the computer and telecommunications industry was provided by a plurality of partly competing funding organizations. They in effect protected niches in which a great variety of technological options evolved (CSTB 1999, pp. 147–150; also Branscomb/Keller 1998).

Such institutional differences between Continental European countries and the U.S. – only briefly illustrated here – accounted for the different speed of the Internet's initial diffusion. A crucial factor was the standards policy (David/Werle 2000). Supported by their national governments and by the Commission of the European Union the European telecommunications and computer industry joined forces in developing and implementing technical standards which were supposed to be integrated parts of a more encompassing multi-layered architecture of »Open Systems Interconnection (OSI)« standards. This architecture was adopted and promoted by the relevant international standardization organizations. It was also officially supported by the U.S. government. But in the heterogeneous and fragmented institu-

tional system of the United States it turned out to be unfeasible to commit all relevant organizations to OSI standards, which, moreover, developed slowly. Some organizations adopted other standards for their computer networks. Many university computer centers opted for the evolving Internet standards based on the TCP/IP protocol stack. Although these standards were developed in R&D projects funded by the US Department of Defense they were not »classified« but open public domain standards which could be implemented free of charge.

Eventually TCP/IP and the Internet succeeded in the battle of standards and – from hindsight – the OSI policy appears to have failed completely. Of course, the picture is more differentiated. European political agencies as well as network operators and computer manufacturers had good reasons to opt for OSI standards. The problem was that for a (too) long period of time these organizations did not tolerate, let alone support, experimenting with Internet standards. In Continental Europe the winning technology was picked by a »cartel« of stakeholders at an early stage of development while in the U.S. the choice between competing technologies was left to the »market«. In the case of the Internet the European stakeholders saddled the wrong horse and it took years until the borders were opened for TCP/IP technology (Werle 2002).

The advantage of the U.S. being the first mover in developing and adopting the Internet was extended because the aforementioned stakeholders including the Commission of the EU hesitated to recognize the Internet's potential. The Commission's so-called Bangemann Report on »Europe and the Global Information Society« (CEC 1994), for instance, only mentioned the Internet in passing but strongly supported the ISDN technology and services concept whose basic ideas were rooted in the OSI and telephone monopoly era. Only after the advent of the World Wide Web and the ensuing transformation of the Internet into a commercially viable global network, have institutional barriers to the Internet's diffusion been removed. Most important was the liberalization and privatization of telecommunications at the end of the 1990s. Riding upon the »wave of liberalization« (Kogut 2003b, p. 43) the Internet is catching up in Europe but it will take a few more years until the institutionally and politically induced digital divide between the United States and Europe is further reduced.

The digital divide from a micro-perspective

Most empirical studies of the digital divide focus on differences at the micro level. Although Internet use continues to grow the gap between those who are connected and those who are not has by no means completely disappeared. This is indicated

by surveys of the U.S. National Telecommunications and Information Administration (NTIA). The NTIA started analyzing differences in Internet access and use in 1995. The results were published in the »Falling Through the Net« series. The first report stressed the divide between those without Internet access called the »information disadvantaged« or »have nots« and the »haves« (NTIA 1995). Follow-up surveys reiterated the divide's persistence. But more recent studies indicate that access to and use of the Internet has been rapidly expanding in the U.S. The latest NTIA report, released in September 2004, indicates that the current political concern in the U.S. is not access as such but broadband connection to the Internet (NTIA 2004). A recent report of the Center for the Digital Future in Los Angeles also points out that the gap concerning (narrowband) access to the Internet is narrowing. The fastest growing Internet user populations in the U.S. are groups once considered the primary victims of the digital divide such as African Americans or older Americans (Center for the Digital Future 2004, p. 20). Similar trends can be observed in other industrialized countries with regard to male/female, income and education differences. Resulting from a combination of individual efforts and public-private initiatives to promote Internet access »underprivileged minorities« are catching up (cf. Frühbrodt 2003).

This phenomenon is not new. As early as in the days of the ARPANET, the Internet's forerunner, the divide among researchers in Universities and research labs between »haves« and »have nots« was an issue. Only scientists and engineers under research contract with the Department of Defense respectively its Advanced Research Projects Agency (ARPA) were entitled to use the ARPANET which linked computer centers and facilitated access to high performance computers as well as file transfer and electronic communication via e-mail. The divide stimulated efforts of the »have-nots« to bridge the gap. Supported by universities, public-private consortiums and other sources they launched networks such as Bitnet and CSnet and also regional research and education networks functionally similar to the ARPANET though not as sophisticated (Mandelbaum/Mandelbaum 1996; CSTB 1999, p. 78; David/Werle 2000). Many of these networks were integrated into the Internet after the U.S. National Science Foundation (NSF) got involved in computer networking and launched NSFnet the core of the emerging Internet. In a sense the computer networks were both causes and consequences of digital disparities: The networks created a divide, which stimulated efforts to get connected or to build complementary networks (Leib/Werle 1998).

As the Internet integrates print, oral and audiovisual communication modalities in a single system it provides many opportunities to augment existing and add new services with more and more sophisticated features. Consequently, and reinforced by the Internet's commercialization, the structures and processes of communication change and become more differentiated (Castells 1996, p. 327ff.). This may create

new digital divides. While the Internet »laggards« are catching up in the area of what may be called standard services the »pioneers« embark on developing/using new services attracting early users who directly (first mover) or indirectly (conspicuous use) benefit from the innovations. Bandwagon effects and chain reactions with more and more users subscribing to the new services may or may not ensue (Werle 1998; Rohlfs 2001; also David 1992). If not new divides stabilize. DiMaggio and Hargittai suggest using the term »inequality« rather than »divide« to denote this phenomenon of differentiated Internet usage (DiMaggio/Hargittai 2001). The authors emphasize that the incentives and constraints resulting from corporate strategies and government regulations account for the inequalities at the level of the Internet users.

Evolving topological divides

It has been argued repeatedly that the Internet mitigates social inequality if access to the network is granted to all citizens. It is also claimed that the Internet's democratic potential mitigates political inequality if only access to the network is assured. But we have already seen that access alone may not remedy all inequalities, neither the social nor the political ones. Current research on the structural effects of Internet usage confirms this position. Rather than mitigating the divides the Internet reflects, reproduces, and in some cases even reinforces »real life« divisions.

The suspicion that specific patterns of Internet usage lead to a fragmentation or »balkanization« of the network's topology was initially expressed in view of scientific communication (Van Alstyne/Brynjolfsson 1996; 1997). The underlying idea is that while scarce travel resources, time constraints and other restrictions usually prevent territorially scattered minorities of scientists from intensive communication the Internet »makes contacts, virtual meetings, information exchange and co-operation much easier« (Nentwich 2003, p. 229). Even small groups of experts in small areas of specialization reach a »critical mass« of interaction partners around the globe via the Internet. This helps establishing ever smaller self-sufficient groups of like-minded concurring colleagues whose internal communication is much more intensive than any contacts to external groups. Such patterns of communication fragment the Internet's topology creating islands that are difficult to access from outside. Fragmentation is a familiar phenomenon particularly with directed networks such as the World Wide Web. The networks break down into several »continents« which in the extreme case are completely isolated from each other (Barabási 2002, p. 166).

To many social scientists examining the connection between the Internet and democracy appears to be more important than analyzing, for instance, the relationship between this network and the structure of scientific communication. Does the Internet create a political digital divide or does it support a development towards an egalitarian, democratic and open society? International comparisons indicate that it is methodologically difficult to establish an unambiguous causal relationship between the Internet's diffusion and the democratic »quality« of a country. While it has been demonstrated that – controlling for other relevant factors – democratic governments facilitate the spread of the Internet (Milner 2003) the inverse causal proposition that interconnectivity increases a society's democratic quality has also been substantiated empirically (Kedzie 1997). Whichever position is right or wrong both only look at access to the network and tell us little about the effects of Internet usage.

Users, individual and organizational, selectively utilize the Internet according to their political, commercial and social interests and preferences (cf. Werle 2000; also Kahler 2000). This includes subscribing to mailing lists, participating in chat rooms, launching websites or setting up links to other WWW sites. Typically the topological effects of Internet usage are not controlled by the users. These aggregate effects rather evolve unintended as a result of individual usage.

For a long time, science treated complex networks including the Internet as being random, *id est* users (nodes) were regarded being connected with randomly placed links. In this perspective the networks appear to be deeply democratic because most nodes have approximately the same number of links. The distribution of the number of connections per node follows a bell-shaped binomial curve. But recent empirical network research and simulation experiments have proved that this assumption is wrong. As a consequence optimistic expectations concerning the Internet's impact on democracy have been frustrated. The Internet does not provide to all users equal opportunities to gain a say and receive attention in the political process. It rather shares certain important characteristics with other large, still growing, so-called »scale-free« networks. With these networks »the popular nodes, called hubs, can have hundreds, thousands or even millions of links. In this sense the network appears to have no scale« (Barabási/Bonabeau 2003, p. 52 (box)). The connections per node are showing a »power law« distribution. The term »power law« describes the organizing principle according to which very few nodes maintain a large percentage of the links in a network. A power law distribution does not have a peak. It can be described by a continuously decreasing function (Barabási 2002, p. 71; Barabási/Bonabeau 2003, p. 53).

Scale-free networks with power law distributions of nodes abound. They have been detected in »cyberspace« as well as in the social world and the natural world. In the World Wide Web, for instance, a few hubs such as Google and Yahoo domi-

nate. Search engines but also other popular hubs are constitutive for what is called the »small world« nature of power law distributed networks. In the case of the World Wide Web this means that with comparatively few »clicks« one can get connected to any node in the network (Barabási 2002; also Buchanan 2002). Not only node connections in the WWW, but also the number of links per Internet router show a power law distribution. Such distributions have also been found in peer-to-peer networks such as Freenet (Hong 2001), in the landscape of mailing lists, or with the relatively new phenomenon of weblogs where a small set of webloggers account for a majority of the traffic in the weblog world (Shirky 2004, p. 1).

Different factors account for the power law »rich get richer« mechanism. They are summarized as »preferential attachment« which includes first mover advantage, history dependence, frequency dependency, positive feedback, network externality, reduction of transaction costs, and a tendency towards agreement or conformity. A more detailed analysis of this bundle of factors and of other factors, which have an influence on preferences is still missing. But given the virtually natural tendency of the Internet and all the networks within this network to develop a structure according to the power law, the »vision of an egalitarian cyberspace« is »utopian« (Barabási 2002, p. 58). The emergence of hubs with a huge number of incoming links such as http://www.whitehouse.gov indicates that the Internet does not mitigate real world political divides. Whatever the majority of users put on the World Wide Web, it will remain unnoticed by virtually all WWW users. Cyberspace for better or worse is part of the real world.

References

Alstyne, Marshall Van/Brynjolfsson, Erik (1996), Could the Internet Balkanize Science?, *Science* 274, Number 5292, Issue of 29 June 1996, pp. 1479–1480.

Alstyne, Marshall Van/Brynjolfsson, Erik (1997), *The Net Effect: Modeling and Measuring the Integration of Electronic Communities*, Paper presented at the Twenty-Fifth Annual Telecommunications Policy Research Conference, 27-29 September 1997, Alexandria, VA.

Barabási, Albert-László (2002), *Linked. The New Science of Networks*, Cambridge, MA.

Barabási, Albert-László/Bonabeau, Eric (2003), »Scale-Free Networks«, *Scientific American* (May), pp. 50–59.

Bornschier, Volker (2001), Generalisiertes Vertrauen und die frühe Verbreitung der Internetnutzung im Gesellschaftsvergleich, *Kölner Zeitschrift für Soziologie und Sozialpsychologie* 53(2), pp. 233–257.

Branscomb, Lewis M./Keller, James H. (1998), Towards a Research and Innovation Policy, Lewis M. Branscomb/Keller, James H. (eds.), *Investing in Innovation. Creating a Research and Innovation Policy that Works*, Cambridge, MA, pp. 462–496.

Buchanan, Mark (2002), *Nexus. Small Worlds and the Groundbreaking Science of Networks*, New York.

Castells, Manuel (1996), *The Information Age: Economy, Society and Culture I: The Rise of the Network Society*, Oxford.

Center for the Digital Future (2004), *Surveying the Digital Future. Ten Years, Ten Trends*. Los Angeles, USC Annenberg School, http://www.digitalcenter.org

CEC (Commission of the European Communities) (1994), *Europe and the Global Information Society*, Recommendations to the European Council, Brussels, CEC.

Chinn, Menzie D./Fairlie, Robert W. (2004), *The Determinants of the Global Digital Divide: A Cross-Country Analysis of Computer and Internet Penetration*, Economic Growth Center Discussion Paper 881, New Haven, CT, Yale University.

CSTB (Computer Science and Telecommunications Board) and National Research Council (1999), *Funding a Revolution: Government Support for Computing Research*, Washington, D.C., National Academy Press.

David, Paul A. (1992), Heroes, Herds and Hysteresis in Technological History: Thomas Edison and »The Battle of the Systems« Reconsidered, *Industrial and Corporate Change* 1(1), pp. 129–180.

David, Paul A./Werle, Raymund (2000), *The Evolution of Global Networks: Technical, Organizational and Cultural Dimensions,* Stanford, Department of Economics/Köln, Max Planck Institute for the Study of Societies, http://www.mpi-fg-koeln.mpg.de/Internet/III.1_daakpdrw.htm

DiMaggio, Paul J./Hargittai, Eszter (2001), *From the »Digital Divide« to »Digital Inequality«: Studying Internet Use As Penetration Increases,* Working Paper 15, Princeton, Princeton University, Center for Arts and Cultural Policy Studies.

DiMaggio, Paul J./Hargittai, Eszter/Neuman, W. Russell/Robinson, John P. (2001), Social Implications of the Internet, *Annual Review of Sociology* 27, pp. 307–336.

Frühbrodt, Lutz (2003), Gefahr erkannt, Gefahr gebannt? Die digitale Spaltung in den USA und Deutschland, Fluck, Winfried/Welf, Werner (eds.), *Wie viel Ungleichheit verträgt die Demokratie?,* Frankfurt a.M., Campus, pp. 205–222.

Hargittai, Eszter (1999), Weaving the Western Web: explaining differences in Internet connectivity among OECD countries, *Telecommunication Policy* 23, pp. 701–718.

Hong, Theodore (2001), Performance, Oram, Andy (ed.), *Peer-to-Peer. Harnessing the Benefits of a Disruptive Technology*, Beijing/Cambridge, pp. 203–241.

Kahler, Miles (2000), Information Networks and Global Politics, Christoph Engel/Kenneth H. Keller (eds.), *Understanding the Impact of Global Networks on Local Social, Political and Cultural Values,* Baden-Baden, pp. 141–157.

Kedzie, Christopher. R. (1997), *Communication and Democracy. Coincident Revolutions and the Emergent Dictator's Dilemma*, Santa Monica, CA. http://www.rand.org/publications/RGSD/RGSD127/index.html

Kogut, Bruce (2003a), Conclusion, Kogut, Bruce (ed.), *The Global Internet Economy*, Cambridge, MA, pp. 437–472.

Kogut, Bruce (2003b), From Pockets of Experimentation to Institutional Change, Kogut, Bruce (ed.), *The Global Internet Economy*, Cambridge, MA, pp. 43–67.

Leib, Volker/Werle, Raymund (1998), Computernetze als Infrastrukturen und Kommunikationsmedien der Wissenschaft, *Rundfunk und Fernsehen* 46 (2-3), pp. 254–273.

Mandelbaum, Richard/Mandelbaum, Paulette A. (1996), The Strategic Future of the Mid-Level Networks, Kahin, Brian (ed.), *Building Information Infrastructure. Issues in the Development of the National Research and Education Network*, New York, pp. 59–118.

Milner, Helen V. (2003), *The Digital Divide: The Role of Political Institutions in Technology Diffusion*, Working Paper, New York, Columbia University http://www.columbia.edu/~hvm1/Research_files/internet_democ2.pdf

Nentwich, Michael (2003), *Cyberscience. Research in the Age of the Internet,* Vienna.

NTIA (National Telecommunications and Information Administration) (1995), *Falling Through the Net. A Survey of the »Have Nots« in Rural and Urban America*, Washington D.C., U.S. Department of Commerce.

NTIA (National Telecommunications and Information Administration) (2004), *A Nation Online: Entering the Broadband Age,* Washington D.C., U.S. Department of Commerce.

Rohlfs, Jeffrey. H. (2001), *Bandwagon Effects in High-Technology Industry*, Cambridge, MA.

Schneider, Volker (2001), *Die Transformation der Telekommunikation, Vom Staatsmonopol zum globalen Markt (1800-2000)*, Frankfurt a.M.

Schneider, Volker/Tenbücken, Marc (eds.) (2004), *Der Staat auf dem Rückzug*, Frankfurt a.M.

Shirky, Clay (2004), *Power Laws, Weblogs, and Inequality*, Internet document http://www.shirky.com/writings/powerlaw_weblog.html

Werle, Raymund (1998), High Tech – Low Use: Probleme der Marktentwicklung bei Multimedia, Mai, Manfred/Neumann-Braun, Klaus (eds.), *Von den »Neuen Medien« zu Multimedia. Gesellschaftliche und politische Aspekte,* Baden-Baden, pp. 58–74.

Werle, Raymund (2000), The Impact of Information Networks on the Structure of Political Systems, Engel, Christoph/Keller, Kenneth H. (eds.), *Understanding the Impact of Global Networks on Local Social, Political and Cultural Values,* Baden-Baden, pp. 167–192.

Werle, Raymund (2001), Institutional Aspects of Standardization – jurisdictional conflicts and the choice of standardization organizations, *Journal of European Public Policy* 8(3), pp. 392–410.

Werle, Raymund (2002), Internet @ Europe: overcoming institutional fragmentation and policy failure, Jordana, Jacint (ed.), *Governing Telecommunications and the New Information Society in Europe*, Cheltenham/Northampton, pp. 137–158.